

Natural factors and mining activity bearings on the water quality of the Choapa basin, North Central Chile: insights on the role of mafic volcanic rocks in the buffering of the acid drainage process

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Abstract This contribution analyzes water chemical data for the Choapa basin, North Central Chile, for the period 1980–2004. The parameters considered are As, Cu, Fe, pH, EC, SO_4^{2-} , Cl^- , and HCO_3^- , from samples taken in nine monitoring stations throughout the basin. Results show rather moderate contents of As, Cu, and Fe, with the exception of the Cuncumén River and the Aucó creek, explained by the influence of the huge porphyry copper deposit of Los Pelambres and by the presence of mining operations, respectively. When compared against results obtained in previous researches at the neighboring Elqui river basin, which host the El Indio Au–Cu–As district, a much reduced grade of pollution is recognized

for the Choapa basin. Considering the effect of acid rock drainage (ARD)-related Cu contents on the fine fraction of the sediments of both river basins, the differences recorded are even more striking. Although the Los Pelambres porphyry copper deposit, on the headwaters of the Choapa river basin, is between one and two orders of magnitudes bigger than El Indio, stream water and sediments of the former exhibit significantly lower copper contents than those of the latter. A main factor which may explain these results is the smaller degree of H^+ -metasomatism on the host rocks of the Los Pelambres deposit, where mafic andesitic volcanic rocks presenting propylitic hydrothermal alteration are dominant. This fact contrast with the highly altered host rocks of El Indio district, where most of them have lost their potential to neutralize ARD.

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Drainage geochemistry · Water quality 36

Introduction 37

Water availability in arid zones basins, both in terms of quantity and quality, is a key element of their sustainable development. In particular, heavy metal contamination is a relevant aspect in arid and semiarid zones with mining activ-